

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2003-158302

(43)Date of publication of application : 30.05.2003

(51)Int.Cl.

H01L 33/00
F21S 8/10
F21V 7/06
// F21W101:14
F21Y101:02

(21)Application number : 2001-355826

(71)Applicant : TOYODA GOSEI CO LTD

(22)Date of filing : 21.11.2001

(72)Inventor : SUEHIRO YOSHINOBU
MISAWA AKIHIRO
TAKAHASHI TOSHINORI
OTA HISATOSHI

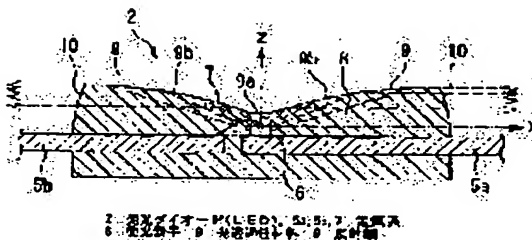
(54) LIGHT EMITTING DIODE

(57)Abstract:

PROBLEM TO BE SOLVED: To achieve a high external emission efficiency in an LED wherein its thin structure creates a good appearance and enables a single LED to irradiate a large area.

SOLUTION: A portion of the light emitted by a light emitting element 6 is directed to the upper surface 9 serving as reflector for an LED 2 and, because it lands there at a great angle of incidence, is totally reflected to travel to a side surface 10. Since the upper surface 9 assumes a shape formed when a part of a parabola with its focal point at the element 6 is rotated on the Z-axis, the whole light reflected by the upper surface 9 proceeds in parallel to the X-Y plane. Since the side surface 10 is a part of a spherical surface with its center at the element 6, the light as is proceeds in parallel, to be emitted in 360° directions at the Z-axis.

Furthermore, the light from the element 6 directly arriving on the side surface 10, which is a part of the spherical surface as stated above, is emitted without being refracted. All the light is emitted upward thanks to the ladder-shaped peripheral reflector surrounding the LED 2.



LEGAL STATUS

[Date of request for examination]

13.05.2004

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision
of rejection]

[Date of requesting appeal against examiner's
decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

* NOTICES *

JPO and NCIP1 are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] Light emitting diode which possesses the 1st reflecting mirror reflected only in the direction of a side face, without extending the light from a light emitting device and said light emitting device prepared above this light emitting device in the vertical direction.

[Claim 2] Light emitting diode with which the mold of the reflector reflected in the direction of a side face, without extending the light which possessed the light transmission nature ingredient which closes a light emitting device, the electric system which supplies power to this light emitting device, and said light emitting device and said electric system, and was emitted from said light emitting device with said light transmission nature ingredient in the vertical direction, and the side-face radial plane which carries out external radiation, without extending the light reflected in said direction of a side face in the vertical direction is carried out.

[Claim 3] Said reflector is light emitting diode according to claim 2 characterized by being the configuration which rotated a part of parabola which is the symmetry axis which uses said light emitting device as a focus, and intersects perpendicularly with the medial axis of said light emitting device to the circumference of the medial axis of said light emitting device.

[Claim 4] Light emitting diode of any one publication of claim 1 characterized by mounting said light emitting device on the circuit board on a metal plate thru/or claim 3.

[Claim 5] Light emitting diode of any one publication of claim 1 characterized by preparing the 2nd reflecting mirror which reflects upwards the light which carried out outgoing radiation in the side of said light emitting device near said light emitting device thru/or claim 4.

[Claim 6] Light emitting diode of any one publication of claim 1 characterized by said the 1st reflecting mirror or said reflector reflecting the light of the range of 60 degrees or more to a medial axis thru/or claim 5.

[Translation done.]

* NOTICES *

JP0 and NCIP1 are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the light emitting diode (it abbreviates also to "LED" hereafter.) used for the LED light applied to lighting systems, such as a light for mount, a display, etc. as the light source.

[0002] In addition, the LED chip itself decides to call the whole luminescence equipment containing optical equipments, such as package resin carrying a "light emitting device", a call, and an LED chip, or a lens system, "light emitting diode" or "LED" into this specification. Furthermore, suppose that lighting systems, such as a light for mount which makes LED the light source, a display, etc. are called an "LED light."

[0003]

[Description of the Prior Art] The LED light which made LED the light source has been used for the back light of an automobile etc. more often with a raise in the brightness of a light emitting device. The spectrum of LED is sharp and its visibility is good. Moreover, since the speed of response is quick, the signal transduction rate to a consecutiveness vehicle is quick, and effectiveness remarkable in compaction of quiescence distance is accepted during high-speed transit. Furthermore, since it is a source of the homogeneous light in itself, LED does not have to carry out the filter cut of the light other than a need color like an incandescent lamp, is efficient as a source of the homogeneous light, and leads also to energy saving.

[0004] An example of this LED light is shown in drawing 8. Drawing 8 is the sectional view showing the whole example configuration of the conventional LED light.

[0005] As shown in drawing 8, the lens mold LED 101 which closed the light emitting device 102 in the convex lens form with the transparence epoxy resin 105 is used for this LED light 100 as the light source. The lens mold LED 101 mounts a light emitting device 102 on lead 103a among one pair of leads 103a and 103b, carries out bonding of a light emitting device 102 and the lead 103b with a wire 104, and closes the whole in a convex lens form with the transparence epoxy resin 105. And it is reflected with a reflecting mirror 106, or it is condensed with Fresnel lens 107, and outgoing radiation of the light which the perimeter of the convex lens mold LED 101 is covered with the reflecting mirror 106 of a paraboloid-of-revolution form, and Fresnel lens 107 is formed in the upper part center section, and was emitted from the lens mold LED 101 after all is altogether carried out to abbreviation parallel upwards. And external radiation of the light which could extend according to the concavo-convex interface prepared in the inferior surface of tongue of the resin lens 109, and penetrated the resin lens 109 is carried out as synchrotron orbital radiation with the flare of 20 abbreviation which is the specification of the back light for mount.

[0006]

[Problem(s) to be Solved by the Invention] However, the luminescence area of predetermined area needs to be made to emit light today by few light emitting devices whose outputs of a light emitting device have improved further. This is for reducing the number of components and reducing the time and effort of component mounting. However, in the LED light 100 using LED101 of the convex lens form mentioned above, if it is going to make a large area emit light

more by one light emitting device, while becoming large and becoming large-sized in the area direction at an analog, it will become thick also in the thickness direction. Moreover, if it is going to make it thin by force, appearance will fall. For this reason, there was a trouble that it could not consider as the thin light source which is the features of LED. Furthermore, since optical control was not carried out and the light which does not result in a reflecting mirror 106 and Fresnel lens 107 could not carry out external radiation from a light emitting device 102, it was what still has a technical problem also from the point of external radiant efficiency.

[0007] Then, this invention can irradiate a large area by one light emitting device well, employing efficiently the point of the thin shape which is the features of LED, and offers a technical problem LED as the light source for LED lights from which high external radiant efficiency is acquired.

[0008]

[Means for Solving the Problem] The light emitting diode concerning invention of claim 1 possesses the 1st reflecting mirror reflected without extending the light from a light emitting device and said light emitting device prepared above this light emitting device in the vertical direction in the direction of a side face.

[0009] By installing the 1st reflecting mirror reflected by this, without extending in the vertical direction in the direction of a side face right above [of a light emitting device], and preparing the circumference reflecting mirror which reflects this reflected light upwards in the perimeter of LED, the external synchrotron orbital radiation of a large area can be obtained, so that a circumference reflecting mirror is separated from the 1st reflecting mirror. Moreover, since the light reflected in the direction of a side face is reflected without spreading in the vertical direction, thickness of the circumference reflecting mirror which reflects this reflected light upwards can be made thin. Furthermore, since optical control is carried out, it is reflected upwards and external radiation of all the light reflected in the side face is carried out, high external radiant efficiency is acquired.

[0010] Thus, taking advantage of the point of the thin shape which is the features of LED, a large area can be irradiated by one light emitting device with a thin shape, and it becomes the light emitting diode for LED lights which can acquire high external radiant efficiency.

[0011] The electric system by which the light emitting diode concerning invention of claim 2 supplies power to a light emitting device and this light emitting device, The reflector reflected in the direction of a side face, without extending the light which possessed the light transmission nature ingredient which closes said light emitting device and said electric system, and was emitted from said light emitting device with said light transmission nature ingredient in the vertical direction, The mold of the side-face radial plane which carries out external radiation is carried out without extending the light reflected in said direction of a side face in the vertical direction.

[0012] That is, it is produced so that the light emitted from the light emitting device may carry out incidence at a bigger include angle than a critical angle in the reflector which is a top face of the light transmission nature ingredient which is closing the light emitting device. Since what is necessary is to lose the need for surface treatment, such as plating and vacuum evaporation, although the reflecting mirror of LED is produced, and just to only adjust the configuration of closure metal mold by this, the making process of light emitting diode is shortened extremely, and is low-cost-ized. Moreover, without extending the light reflected in the direction of a side face in the vertical direction, by considering as the side-face radial plane which carries out external radiation, the side face of a light transmission nature ingredient is penetrated to a side face as it is, and is reflected upwards by the circumference reflecting mirror of the LED exterior. Since it is reflected upwards by the circumference reflecting mirror, each light emitted to the top face and the side face of a light transmission nature ingredient from the light emitting device by this serves as light emitting diode suitable for an LED light with high external radiant efficiency, employing the thin description of LED efficiently.

[0013] The light emitting diode concerning invention of claim 3 is the configuration which rotated a part of parabola which is the symmetry axis which said reflector uses said light emitting device as a focus, and intersects perpendicularly with the medial axis of said light emitting device to the

circumference of the medial axis of said light emitting device in the configuration of claim 2.

[0014] this -- effectiveness according to claim 2 -- in addition, the light which was emitted from the light emitting device and hit one part of said reflectors -- all -- the medial axis of said light emitting device -- abbreviation -- total reflection is carried out in the perpendicular direction of a side face. Consequently, since all the light reflected in said reflector is reflected without spreading in the vertical direction in the direction of a side face, thickness of the circumference reflecting mirror of the LED exterior can be made thin.

[0015] Thus, taking advantage of the point of the thin shape which is the features of LED, a large area can be irradiated by one light emitting device with a thin shape, and it becomes the light emitting diode for LED lights which can acquire high external radiant efficiency.

[0016] The light emitting diode concerning invention of claim 4 mounts said light emitting device on the circuit board on a metal plate in any one configuration of claim 1 thru/or claim 3.

[0017] the effectiveness of any one publication of claim 1 thru/or claim 3 -- in addition, in order that heat saturation may not occur even if heat dissipation nature improves sharply and supplies a high current to a light emitting device since the light emitting device is mounted on the metal plate which was excellent in thermal conductivity in this way, there is an advantage that a big optical output is obtained. Thus, according to the light emitting diode of this invention, it becomes the LED light in which it has big heat dissipation nature with a thin shape, and a big optical output is obtained, without receiving a limit of heat saturation, and bright synchrotron orbital radiation is obtained.

[0018] The light emitting diode concerning invention of claim 5 prepares the 2nd reflecting mirror which reflects upwards the light which carried out outgoing radiation in the side of said light emitting device near said light emitting device in any one configuration of claim 1 thru/or claim 4.

[0019] In addition to the effectiveness of any one publication of claim 1 thru/or claim 4, to light being emitted only for right above a light emitting device up in LED concerning invention of claim 1, light comes to be emitted up also from the circumference of a light emitting device, it seems that the whole is emitting light more, and the effectiveness that appearance improves is acquired by this.

[0020] In any one configuration of claim 1 thru/or claim 5, as for the light emitting diode concerning invention of claim 6, the top face of said 1st reflecting mirror or said closure side reflects the light of the range of 60 degrees or more to a medial axis.

[0021] All the light that is emitted within the limits of 60 degrees from the medial axis of the top face of a light emitting device by this in addition to the effectiveness of any one publication of claim 1 thru/or claim 5 is reflected in the direction of a side face on the top face of the 1st reflecting mirror or said closure side, and, as for the light emitted within larger limits than 60 degrees from a medial axis, all are reflected upwards by the circumference reflecting mirror toward the direction of a direct side face. Therefore, since external radiation of the light of most which is emitted from a light emitting device is carried out from an LED light, it is set to LED for LED lights with very high external radiant efficiency.

[0022]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.

[0023] the gestalt 1 of operation -- the gestalt 1 of operation of this invention is first explained with reference to drawing 1 **** drawing 2.

[0024] Drawing 1 is drawing of longitudinal section showing the whole LED configuration concerning the gestalt 1 of operation of this invention. The A-A sectional view of (a) and (c) of the top view showing the whole LED light configuration using LED which drawing 2 (a) requires for the gestalt 1 of operation of this invention, and (b)) are the enlarged drawings of P part of (b).

[0025] First, the configuration of LED2 of the gestalt 1 of this operation is explained with reference to drawing 1. Here, the Z-axis is set as the medial axis of a light emitting device, a light emitting device top face is made into that zero, and it is determined that the X-axis and a Y-axis cross a right angle in this zero. Also in the gestalt of each following operation, it is the

same.

[0026] As shown in drawing 1, the light emitting device 6 is mounted at the tip of large lead plate 5a of area among one pair of lead plates 5a and 5b formed on the X-Y flat surface. Bonding of the electrode of the top face of a light emitting device 6 and the tip of lead plate 5b is carried out with a wire 7, and electrical installation is made. the tip of the lead plates 5a and 5b as these electric systems, a light emitting device 6, and a wire 7 -- a resin seal -- public funds -- it is set to a mold and the resin seal is carried out to the cross-section configuration as shown in drawing with the transparence epoxy resin 8 as a light transmission nature ingredient. Here, a configuration like an umbrella where a part of parabola (it is the range of 60 degrees to the Z-axis) which there is a flat side in a part for the core of the top face 9 of LED2, uses the core of the luminescence side of a light emitting device 6 as a focus as the 1st reflecting mirror following this flat side, and sets a symmetry axis as X shaft orientations was rotated around the Z-axis is carried out. Moreover, the side face 10 of LED2 is making a part of spherical surface centering on a light emitting device 6.

[0027] That is, in LED2 of the gestalt 1 of this operation, the mold of the reflector 9 reflected in the direction of a side face, without extending the light emitted from the light emitting device 6 with the transparence epoxy resin 8 as a light transmission nature ingredient in the vertical direction and the side-face radial plane 10 which carries out external radiation, without extending the light reflected in the direction of a side face in the vertical direction is carried out.

[0028] Next, as shown in drawing 2, the LED light 1 using LED2 of the gestalt 1 of this operation carries LED2 used as the light source in the core of a circular body, and is having structure which surrounded the perimeter with the stair-like reflecting mirror 3 of the concentric circle as a circumference reflecting mirror. As shown in drawing 2 (c), reflector 3a of this reflecting mirror 3 inclines at about 45 degrees to the X-Y flat surface of drawing. After fabricating a reflecting mirror 3 with transparence acrylic resin, it carries out aluminum vacuum evaporatio and forms the reflector.

[0029] How depending on which the LED light 1 which has this configuration shines is explained with reference to drawing 1 and drawing 2. If a light emitting device 6 is shone applying an electrical potential difference to the lead plates 5a and 5b of LED2, among the light emitted from the light emitting device 6, a Z direction, i.e., the light which went to right above, passes through the transparence epoxy resin 8 as it is, it goes straight on, it will pass through the transparent dark room which is put on the LED light 1 and which is not illustrated, and external radiation will be carried out. Moreover, a light of 60 degrees or more within the limits reaches the top face 9 as the 1st reflecting mirror to the Z-axis among the light emitted from the light emitting device 6, since such light has the large incident angle, total reflection of them is carried out altogether; and they goes to a side face 10. All the light reflected on the top face 9 since the configuration which rotated a part of parabola which a top face 9 uses a light emitting device 6 as a focus here, and sets a symmetry axis as the X-axis around the Z-axis was carried out progresses in parallel with an X-Y flat surface, and since the side face 10 is making a part of spherical surface centering on a light emitting device 6, light progresses in parallel almost as it is, and is emitted in the direction of 360 degrees the circumference of the Z-axis at an abbreviation plane.

Furthermore, since the side face 10 is making a part of spherical surface centering on a light emitting device 6, the light which went to the side face 10 directly from the light emitting device 6 is emitted with the sense as it is, without being refracted.

[0030] Although there is a stair-like reflecting mirror 3 as a circumference reflecting mirror in the point and there is reflector 3a which has the inclination which are 45 abbreviation Since the light directly emitted from the side faces 10 including the light which was reflected on the top face 9 and has progressed to abbreviation parallel at the X-Y flat surface is also close to a X-Y flat surface in parallel, Each will progress upwards almost perpendicularly soon, at least, the light reflected by reflector 3a passes through the transparent dark room which is not illustrated within the limits of 20 degrees from the Z-axis, and external radiation is carried out. In addition, since the light currently expressed as "parallel" above also has the magnitude of a light emitting device 6, although it does not become parallel, any light becomes almost parallel and becomes the perfect thing which enters within the limits of 20 degrees certainly from the Z-axis at least.

[0031] Thus, taking advantage of the advantage of the thin shape which is the features of LED, LED2 of the gestalt 1 of this operation can irradiate a large area by one light emitting device with a thin shape, and serves as the light source suitable for the LED light 1 which can acquire high external radiant efficiency.

[0032] LED of the gestalt 2 of operation, next the gestalt 2 of operation of this invention is explained with reference to drawing 3. Drawing 3 is drawing of longitudinal section showing the whole LED configuration concerning the gestalt 2 of operation of this invention.

[0033] As shown in drawing 3, only the circumference of a light emitting device 6 dents the lead plates 12a and 12b of a pair, and LED11 of the gestalt 2 of this operation is taken as the 2nd reflecting mirror. To light being emitted only for right above a light emitting device 6 to the direct upper part in the basic form of drawing 1 by this, light comes to be emitted up also from the circumference of the light emitting device 6 in LED11, it seems that the whole is emitting light more, and the effectiveness that appearance improves is acquired.

[0034] LED of the gestalt 3 of operation, next the gestalt 3 of operation of this invention is explained with reference to drawing 4. Drawing 4 is drawing of longitudinal section showing the whole LED configuration concerning the gestalt 3 of operation of this invention.

[0035] He reflects the light emitted to a slanting lower part from a light emitting device 6, and is trying to emit light up in LED16 of the gestalt 3 of this operation by preparing the pattern as the 2nd reflecting mirror as shown in the lead plates 13a and 13b of a pair with half etching or a ***** pattern at drawing 4. In this way, by forming two or more concentric circle reflecting mirrors, it can show as the whole is emitting light more like the gestalt 2 of operation, and improvement in appearance can be aimed at. In addition, the effectiveness of the poor exfoliation reduction by the adhesion area of the transparence epoxy resin 8 and the lead plates 13a and 13b not being a flat-surface configuration, and carrying out increase and an adhesion configuration in this case, is also acquired by coincidence. Especially, in the case of generation of heat large high current type, it is effective.

[0036] LED of the gestalt 4 of operation, next the gestalt 4 of operation of this invention is explained with reference to drawing 5. Drawing 5 is the explanatory view showing the side-face configuration of LED concerning the gestalt 4 of operation of this invention.

[0037] In LED17 of the gestalt 4 of this operation, as shown in drawing 5, the side-face configuration of the closure part by the transparence epoxy resin 8 of LED17 is changed. Although the side face 10 of LED2 of the gestalt 1 of operation is a part of spherical-surface configuration centering on a light emitting device 6, and incidence of the light which came out of the light emitting device 6 is carried out to an abbreviation perpendicular on a side face 10 and it goes straight on as it is In this modification 3, the side face 14 is making a part of ellipsoid front face which uses a light emitting device 6 as one focus, and the light which came out of the light emitting device 6 is refracted a little caudad to the rectilinear-propagation direction in a side face 14. Therefore, even if it brings the stair-like reflecting mirror 3 around LED2 to a lower location, it becomes the LED light in which high external radiant efficiency is acquired. It is set to LED which can make an LED light a thin shape more by this.

[0038] LED of the gestalt 5 of operation, next the gestalt 5 of operation of this invention is explained with reference to drawing 6. Drawing 6 is the partial enlarged drawing showing the top face of LED concerning the gestalt 5 of operation of this invention.

[0039] In LED18 of the gestalt 5 of this operation, as shown in drawing 6, it has considered as the configuration which rotated a part of parabola which uses a light emitting device 6 as a focus altogether to a part for the core of a top face 9 to the circumference of the Z-axis. And reflection to the side in the top face 9 as a reflecting mirror of LED is not depended on the total reflection in the interface of the transparence epoxy resin 8 and air, but plating, vacuum evaporatio, etc. are given to a top face 9, and the metallic reflection film 15 is made to adhere to it. It is set to LED which emits the abbreviation total luminous flux which the light emitting devices 6 including the light emitted to right above emit from a light emitting device 6 by this to a side face.

[0040] [Example of a comparison] Here, the example of a comparison with the gestalt of each operation of this invention is explained with reference to drawing 7. Drawing 7 is drawing of

longitudinal section showing the whole LED configuration concerning the example of a comparison with the gestalt of each operation of this invention.

[0041] As shown in drawing 7, a light emitting device 34 is mounted at the tip of lead plate 33a among one pair of lead plates 33a and 33b, bonding of the electrode of the top face of a light emitting device 34 and the tip of lead plate 33b is carried out with a wire 35, and, as for LED31 of this example of a comparison, electrical installation is made. The closure of the tip of the lead plates 33a and 33b as these electric systems, a light emitting device 34, and the wire 35 is carried out with the transparence epoxy resin 36 as a light transmission nature ingredient. The appearance of this transparence epoxy resin 36 is carrying out the configuration where the upper part of the globular form one half (convex lens form) centering on a light emitting device 34 was scooped out in the cone form. In this case, although total reflection of the light which came out of the light emitting device 34 is carried out mostly on the top face 32, since the reflected light is equivalent to the synchrotron orbital radiation to a top face 32 from the reflection point of a light emitting device 34, it emanates from a side face 37 not with the condensed light but with a flare angle. Therefore, as compared with LED2 which the circular stair-like reflecting mirror as a circumference reflecting mirror which reflects such light upwards also used with the gestalt 1 of operation, a long thing is needed for a Z direction.

[0042] Thus, in LED31 concerning this example of a comparison, it cannot be made a thin shape as an LED light, and external radiant efficiency cannot be made high, either, and the purpose of this invention is not attained.

[0043] In the gestalt of each above-mentioned implementation, although the transparence epoxy resin is mainly used as a light transmission nature ingredient which closes a light emitting device etc., other light transmission nature ingredients are sufficient.

[0044] Moreover, in the gestalt of each above-mentioned implementation, although the light emitting device is mounted on one side of one pair of lead plates, you may mount on the circuit board on a metal plate. Thus, even if heat dissipation nature improves sharply and supplies a high current to a light emitting device by mounting a light emitting device on the metal plate excellent in thermal conductivity, in order that heat saturation may not occur, there is an advantage that a big optical output is obtained.

[0045] It is not limited to the gestalt of each above-mentioned implementation about the configuration of the part of others of light emitting diode, a configuration, quantity, the quality of the material, magnitude, and connection relation.

[0046]

[Effect of the Invention] As explained above, the light emitting diode concerning invention of claim 1 possesses the 1st reflecting mirror reflected without extending the light from a light emitting device and said light emitting device prepared above this light emitting device in the vertical direction in the direction of a side face.

[0047] By installing the 1st reflecting mirror reflected by this, without extending in the vertical direction in the direction of a side face right above [of a light emitting device], and preparing the circumference reflecting mirror which reflects this reflected light upwards in the perimeter of LED, the external synchrotron orbital radiation of a large area can be obtained, so that a circumference reflecting mirror is separated from the 1st reflecting mirror. Moreover, since the light reflected in the direction of a side face is reflected without spreading in the vertical direction, thickness of the circumference reflecting mirror which reflects this reflected light upwards can be made thin. Furthermore, since optical control is carried out, it is reflected upwards and external radiation of all the light reflected in the side face is carried out, high external radiant efficiency is acquired.

[0048] Thus, taking advantage of the point of the thin shape which is the features of LED, a large area can be irradiated by one light emitting device with a thin shape, and it becomes the light emitting diode for LED lights which can acquire high external radiant efficiency.

[0049] The electric system by which the light emitting diode concerning invention of claim 2 supplies power to a light emitting device and this light emitting device, The reflector reflected in the direction of a side face, without extending the light which possessed the light transmission nature ingredient which closes said light emitting device and said electric system, and was

emitted from said light emitting device with said light transmission nature ingredient in the vertical direction. The mold of the side-face radial plane which carries out external radiation is carried out without extending the light reflected in said direction of a side face in the vertical direction.

[0050] That is, it is produced so that the light emitted from the light emitting device may carry out incidence at a bigger include angle than a critical angle in the reflector which is a top face of the light transmission nature ingredient which is closing the light emitting device. Since what is necessary is to lose the need for surface treatment, such as plating and vacuum evaporation, although the reflecting mirror of LED is produced, and just to only adjust the configuration of closure metal mold by this, the making process of light emitting diode is shortened extremely, and is low-cost-ized. Moreover, without extending the light reflected in the direction of a side face in the vertical direction, by considering as the side-face radial plane which carries out external radiation, the side face of a light transmission nature ingredient is penetrated to a side face as it is, and is reflected upwards by the circumference reflecting mirror of the LED exterior. Since it is reflected upwards by the circumference reflecting mirror, each light emitted to the top face and the side face of a light transmission nature ingredient from the light emitting device by this serves as light emitting diode suitable for an LED light with high external radiant efficiency, employing the thin description of LED efficiently.

[0051] The light emitting diode concerning invention of claim 3 is the configuration which rotated a part of parabola which is the symmetry axis which said reflector uses said light emitting device as a focus, and intersects perpendicularly with the medial axis of said light emitting device to the circumference of the medial axis of said light emitting device in the configuration of claim 2.

[0052] the light which was emitted from the light emitting device by this and hit one part of said reflectors by it -- all -- the medial axis of said light emitting device -- abbreviation -- total reflection is carried out in the perpendicular direction of a side face. Consequently, since all the light reflected in said reflector is reflected without spreading in the vertical direction in the direction of a side face, thickness of the circumference reflecting mirror of the LED exterior can be made thin.

[0053] Thus, taking advantage of the point of the thin shape which is the features of LED, a large area can be irradiated by one light emitting device with a thin shape, and it becomes the light emitting diode for LED lights which can acquire high external radiant efficiency.

[0054] The light emitting diode concerning invention of claim 4 mounts said light emitting device on the circuit board on a metal plate in any one configuration of claim 1 thru/or claim 3.

[0055] Thus, in order that heat saturation may not occur even if heat dissipation nature improves sharply and supplies a high current to a light emitting device since the light emitting device is mounted on the metal plate excellent in thermal conductivity, there is an advantage that a big optical output is obtained. Thus, according to the light emitting diode of this invention, it becomes the LED light in which it has big heat dissipation nature with a thin shape, and a big optical output is obtained, without receiving a limit of heat saturation, and bright synchrotron orbital radiation is obtained.

[0056] The light emitting diode concerning invention of claim 5 prepares the 2nd reflecting mirror which reflects upwards the light which carried out outgoing radiation in the side of said light emitting device near said light emitting device in any one configuration of claim 1 thru/or claim 4.

[0057] To light being emitted up only for right above a light emitting device in LED concerning invention of claim 1 by this, light comes to be emitted up also from the circumference of a light emitting device, it seems that the whole is emitting light more, and the effectiveness that appearance improves is acquired.

[0058] In any one configuration of claim 1 thru/or claim 5, as for the light emitting diode concerning invention of claim 6, the top face of said 1st reflecting mirror or said closure side reflects the light of the range of 60 degrees or more to a medial axis.

[0059] All the light emitted within the limits of 60 degrees from the medial axis of the top face of a light emitting device is reflected in the direction of a side face by this on the top face of the 1st reflecting mirror or said closure side, and, as for the light emitted within larger limits than 60

degrees from a medial axis, all are reflected upwards by the circumference reflecting mirror toward the direction of a direct side face. Therefore, since external radiation of the light of most which is emitted from a light emitting device is carried out from an LED light, it is set to LED for LED lights with very high external radiant efficiency.

[Translation done.]

*** NOTICES ***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] Drawing 1 is drawing of longitudinal section showing the whole LED configuration concerning the gestalt 1 of operation of this invention.

[Drawing 2] The A-A sectional view of (a) and (c of the top view showing the whole LED light configuration using LED which drawing 2 (a) requires for the gestalt 1 of operation of this invention, and (b)) are the enlarged drawings of P part of (b).

[Drawing 3] Drawing 3 is drawing of longitudinal section showing the whole LED configuration concerning the gestalt 2 of operation of this invention.

[Drawing 4] Drawing 4 is drawing of longitudinal section showing the whole LED configuration concerning the gestalt 3 of operation of this invention.

[Drawing 5] Drawing 5 is the explanatory view showing the side-face configuration of LED concerning the gestalt 4 of operation of this invention.

[Drawing 6] Drawing 6 is the partial enlarged drawing showing the top face of LED concerning the gestalt 5 of operation of this invention.

[Drawing 7] Drawing 7 is drawing of longitudinal section showing the whole LED configuration concerning the example of a comparison with the gestalt of each operation of this invention.

[Drawing 8] Drawing 8 is the sectional view showing the whole example configuration of the conventional LED light.

[Description of Notations]

2, 11, 16, 17, 18 Light emitting diode (LED)

5a, 5b, 7, 12a, 12b, 13a, 13b Electric system

6 Light Emitting Device

8 Light Transmission Nature Ingredient

9 1st Reflecting Mirror

15 Metal Side

[Translation done.]

* NOTICES *

JPO and NCIP are not responsible for any damages caused by the use of this translation.

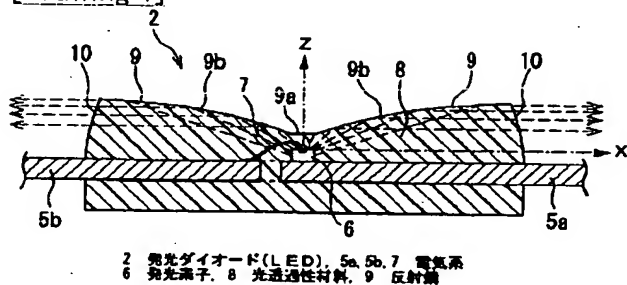
1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.*** shows the word which can not be translated.

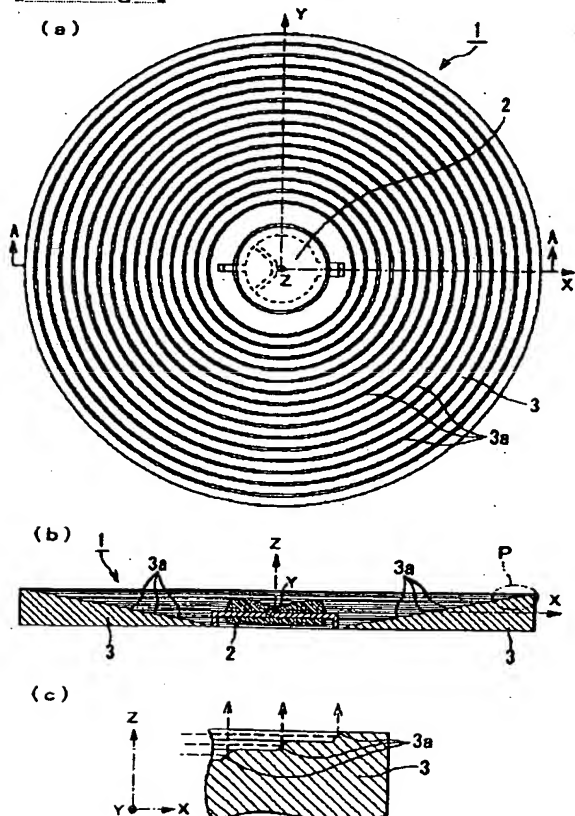
3.In the drawings, any words are not translated.

DRAWINGS

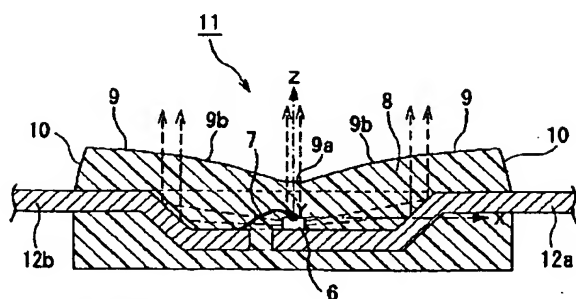
[Drawing 1]



[Drawing 2]

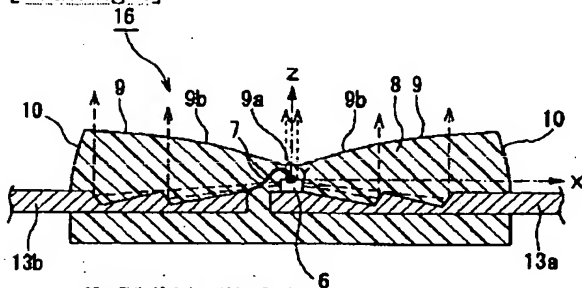


[Drawing 3]



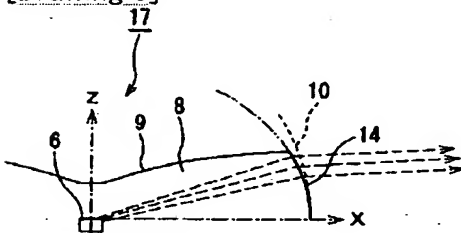
11 発光ダイオード(LED)
12a, 12b 電気系

[Drawing 4]



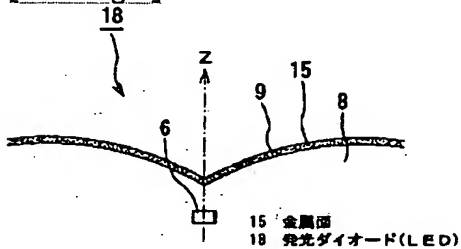
16 発光ダイオード(LED)
13a, 13b 電気系

[Drawing 5]



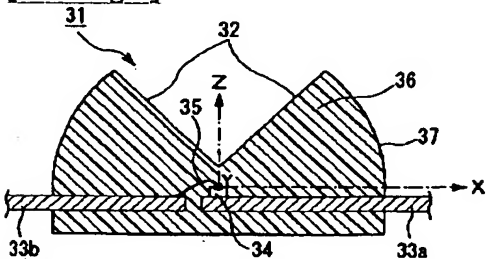
17 発光ダイオード(LED)

[Drawing 6]

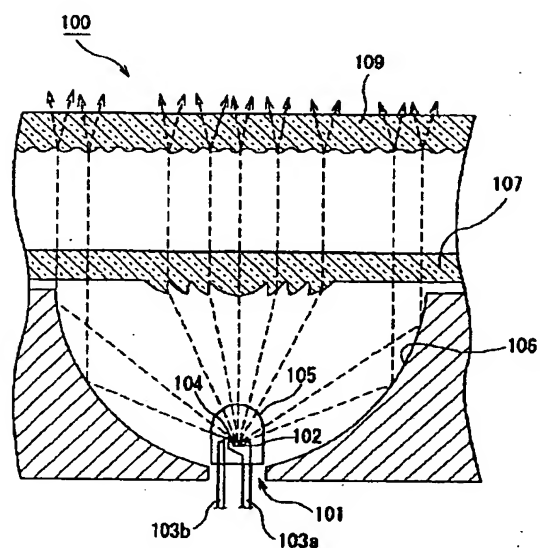


15 金属部
18 発光ダイオード(LED)

[Drawing 7]



[Drawing 8]



[Translation done.]